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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/847,511	05/02/2001	Yu-Hsi Wang	67,200-404	7868

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EXAMINER

KORNAKOV, MICHAEL

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 10/17/2002

2

Please find below and/or attached an Office communication concerning this application or proceeding.

72-2

Office Action Summary

Application No.

09/847,511

Applicant(s)

WANG ET AL.

Examiner

Michael Kornakov

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recited in claim 17 "A method ...to claim 16 further comprising the step after said moving step of immersing said at least one wafer ..." is not readily ascertainable. Clarification and/or correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 2, 5, 6, 9, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505).

Komatsuzaki teaches apparatus for any liquid treatment of a wafer and a method of treatment, utilizing the said apparatus. The apparatus of Komatsuzaki comprises treatment vat with treatment solution, means for holding the wafer(s) in vertical position and means for reciprocally moving the wafers' holding means with wafer(s) being immersed into the treatment solution. The wafer holding means are moved reciprocally up and down by a mechanism with a cylinder and a piston (see Abstract, col.1, lines 6-12; col. 2, lines 15-37; col.3, lines 46-63; col.4, lines 60-65; col.5, lines 58-62; Fig.4 and 5). After completion of liquid treatment in the treatment vat, the wafer is dump rinsed in the rinse vat 16 (col.5, lines 8-12).

The teaching of Komatsuzaki differs from the instantly claimed by not specifically indicating a frequency of up and down motion. Komatsuzaki also remains silent about the use of heating means for heating the treatment solution.

Erk discloses method for cleaning semiconductor wafers, wherein the wafers are reciprocated up and down at a rate of at least approximately 20 cycles per minute and more preferably at a rate of at least 60 cycles per minute (col.6, lines 28-31). Erk also indicates that the reciprocating rate affects the processing time. Erk also indicates that raising the bath temperature is beneficial for cleaning procedure (col.3, lines 28-29). Therefore the heating means are inherent in the teaching of Erk.

Because both Komatsuzaki and Erk are concerned with liquid treatment of semiconductor wafers utilizing reciprocating motion and Erk provides the workable values of reciprocal frequency for efficient cleaning, one skilled in the art, motivated by the teaching of Erk, would have found it obvious to utilize the values of reciprocal frequency of Erk in the teaching of Komatsuzaki in order to sufficiently process the wafers of Komatsuzaki in a timely manner and thus to arrive at the subject matter as instantly claimed.

Because both Komatsuzaki and Erk are concerned with liquid treatment of semiconductor wafers utilizing reciprocating motion and Erk provides for heating of the bath with cleaning liquid, one skilled in the art, motivated by the teaching of Erk, would have found it obvious to use the heating means in the apparatus of Komatsuzaki in order to control the temperature of treatment solution and thus to increase the effectiveness of wet processing of wafers of Komatsuzaki.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Handbook of Semiconductor Wafer Cleaning Technology (The Book).

The combined teaching of Komatsuzaki and Erk remains silent about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki and Erk, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

8. Claim 7 rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Cardani et al. (U.S. 5,003,999).

While teaching the use of heating means, the combined disclosure of Komatsuzaki and Erk remains silent about the utilization of **electrical** heating means. However, conventionally controlled electrical resistors as heating means for liquid processing baths are notoriously utilized in the art of wet processing of semiconductor wafers, as provided by Cardani (paragraph, bridging col.1 and 2).

Therefore, one skilled in the art, motivated by the teaching of Cardani, would have found it obvious to utilize the electrical heating means, as disclosed

by Cordani, in order to provide precise and convenient control of temperature of treatment solution in the teaching of Komatsuzaki and Erk.

9. Claims 8, 10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Ward et al. (U.S. 5,988,186).

The combined teaching of Komatsuzaki and Erk does not specifically provide for the stripper solution that comprises DMSO and TMAH. However it indicates that the disclosed apparatus can be used for **any liquid treatment** of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Ward teaches an aqueous composition, comprising DMSO and TMAH (see example in paragraph, bridging col.6 and 7), which is useful for treatment wafer surfaces during the fabrication of integrated circuits (paragraph bridging col.4 and 5; col. 5, lines 3-31). The composition of Ward is non-corrosive, non-flammable and of low toxicity to the environment.

Because both the combined teaching of Komatsuzaki and Erk and Ward are concerned with liquid treatment of semiconductor wafers and Ward provides for the environmentally safe and non-toxic treatment composition, one skilled in the art, motivated by the teaching of Ward, would have found it obvious to utilize the treatment composition of Ward in order to provide non-corrosive and environmentally safe treatment media in the combined teaching of Komatsuzaki and Erk with the reasonable expectation of success.

10. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. 5,992,431) in view of Erk et al. (U.S. 5,593,505) and in further view of Applicants' admittance.

Weber teaches device for treating substrates, such as semiconductor wafers, and a method of treatment, utilizing the said device. The device of Weber comprises fluid container (compare to tank, as instantly claimed) into which liquid chemicals can be introduced (col. 5, lines 29-35), a wafer receiving device (compare to wafer holder, as instantly claimed) and means for lifting and lowering or reciprocating vertically the wafer receiving device, thus reciprocally moving the wafers (col.7, lines 49-53). The liquid media is contained within the fluid container during wafer processing (col.8, lines 17-35). The device of Weber also comprises heating means for heating the fluid contained in said fluid container (col.6, lines 38-41).

The teaching of Weber differs from the instantly claimed by not specifically indicating a frequency of reciprocal motion.

Erk discloses method for cleaning semiconductor wafers, wherein the wafers are reciprocated up and down at a rate of at least approximately 20 cycles per minute and more preferably at a rate of at least 60 cycles per minute (col.6, lines 28-31). Erk also indicates that the reciprocating rate affects the cleaning time. Because both Weber and Erk are concerned with liquid treatment of semiconductor wafers utilizing reciprocating motion and Erk provides the workable values of reciprocal frequency for efficient treatment, one skilled in the art, motivated by the teaching of Erk, would have found it obvious to utilize the

values of reciprocal frequency of Erk in the teaching of Weber in order to sufficiently process the wafers of Weber in a timely manner and thus to arrive at the subject matter as instantly claimed.

In regard to claims 3 and 4, which are concerned with specific design of wafer holders, it is noticed here that the claimed wafer holders are typical holders, commonly and widely used in the art (paragraph, bridging pages 16 and 16 of the instant disclosure). Therefore, one skilled in the art would have found it obvious to utilize the conventional wafer holders in the combined teaching of Weber and Erk in order to provide economical and technologically compatible equipment for semiconductor wafer(s) treatment with the reasonable expectation of success.

11. Claims 12, 13, 16, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki and Erk, as discussed above and in view of Noguchi (U.S. 4,657,631).

The combined teaching of Komatsuzaki and Erk does not specifically indicates the step of stationary soaking of the wafer in treatment solution.

Noguchi teaches removal of a solid layer of photosensitive material from the substrate surface by stationary soaking the substrate in a liquid, which is capable of dissolving the photosensitive solid layer followed by agitation of the substrate in order to accelerate the removal process.

Because the combined teaching of Komatsuzaki and Erk and Noguchi both are concerned with liquid treatment of substrates and Noguchi provides for the acceleration of treatment by stationary soaking the substrate in a processing

liquid, one skilled in the art motivated by the disclosure of Noguchi would have found it obvious to soak the substrate in the process of Komatsuzaki and Erk separately from its agitation in order to effectively process the substrate of Komatsuzaki and Erk in a timely manner.

In regard to soaking time, it is noted that this parameter is result effective, because the required dissolving or, alternatively, swelling of the removable layer depends on the characteristics of this particular layer, applied solution and on the duration of dissolution or swelling step. However, discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk and Noguchi (U.S. 4,657,631) and in further view of Applicants' admittance.

The combined teaching of Komatsuzaki, Erk and Noguchi does not specifically provide for the stripper solution that comprises DMSO. However it indicates that the disclosed wafer processing can be utilized for **any type of liquid treatment** of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Regarding the use of solution, which comprises DMSO, it is noticed here that solutions containing DMSO are conventionally utilized in wet dip processing, as instantly indicated by Applicants on page 2, first paragraph. Therefore, one skilled in the art would have found it obvious to utilize the conventional

biodegradable and non toxic processing solution, containing DMSO for substrate treatment in the combined teaching of Komatsuzaki and Erk, and Noguchi with the reasonable expectation of success.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk, and Noguchi, as discussed above and in further view of Handbook of Semiconductor Wafer Cleaning Technology (The Book).

The combined teaching of Komatsuzaki, Erk and Noguchi remains silent about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki, Erk and Noguchi, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

14. Therefore, combination of references renders claims 1-20 prima facie obvious and properly rejected under 35 U.S.C. 103(a).

Conclusion

The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure and is cited in PTOL-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (703) 305-0400. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872 9310 for regular communications and (703) 872 9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308 2450.

Michael Kornakov
Examiner
Art Unit 1746

MK
October 11, 2002

A handwritten signature in black ink, appearing to read 'Randy Gulakowski', with a stylized, cursive script.

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700